Representation theory of algebraic groups and related topics

abstract

Haruko Nishi (Josai University), A pseudo-metric on moduli space of hyper-elliptic curves

Troyanov 's theorem says that the moduli space of Riemann surfaces of genus g with p punctures is identified with the space of Euclidean cone structures on the surface of genus g up to homothety when $p > 0$. In this talk, we will discuss a pseudo-Hermitian metric on the space of moduli space of hyperelliptic curves, which is induced from the area form on the moduli space of Euclidean cone structures.

Masatoshi Iida (Josai University), Restriction of the system of differential equations satisfied by the matrix coefficient of principal representation of $Sp(2, \mathbb{R})$

Oshima and Shimeno studied the system of ordinary differential equations which is obtained by the Heckman-Opdam system restricting to singular lines. In this talk, I will introduce the restriction of the system of differential equations satisfied by 2 dimensional spherical functions (matrix coefficients of the principal series representation of $Sp(2, \mathbb{R})$) of C_2 type.

Kazunari Sugiyama (Chiba Institute of Tecnology), L-functions associated with boundary values of automorphic forms on $SL(2, \mathbb{R})$

First, after T.Suzuki, automorphic distributions on prehomogeneous vector spaces and their L-functions are defined. In this talk, we will be concerned mainly on $(GL(1), V(1))$. Then we show that such automorphic distributions can be constructed with boundary values of Maass wave forms on $SL(2, \mathbb{R})$. We also discuss the converse theorem. This talk is based on joint work with Fumihiro Sato, Keita Tamura (Rikkyo Univ.) Tadashi Miyazaki (Kitasato Univ.),

Hideyuki Ishi (Nagoya University), Fourier transform of relatively invariant functions on a homogeneous convex domain

A convex domain containing no line in a real vector space is called a homogeneous convex domain if an affine transformation group acts on it transitively. A homogeneous cone is a special case of homogeneous convex domain, while a general homogeneous convex domain is also closely related to a homogeneous cone. In this talk, we calculate explicitely the Fourier-Laplace transform of relatively invariant functions on the domain, and discuss analogues of b-functions.

Fumihiro Sato (Rikkyou University), Local functional equation associated with decomposable graphs

Denote by $\mathrm{Sym}_G^*(\mathbb{R})$ its dual vector space. With a statistical motivation, Letac and Massam (Ann. of Statistics, 2007) calculated explicitly the Gamma integral attached to the cones of positive definite "matrices" in $\mathrm{Sym}_G^*(\mathbb{R})$ and the dual cone in $\mathrm{Sym}_G(\mathbb{R})$ under the condition that G is decomposable. From their result we can derive rather easily the functional equation for the local zeta functions attached to the cones. In this talk, we prove that the local zeta functions attached to not necessarily definite connencted components also satisfy functional equations. The cones for decomposable G are in general not homogeneous and our functional equations can not be obtained from the theory of prehomogeneous vector spaces.

Yumiko Hironaka (Waseda University), p-adic unitary hermitian matrices and spherical functions

We investigate the space X of unitary hermitian matrices over $\mathfrak{p}$-adic fields through spherical functions. First we consider Cartan decomposition of X, and give precise representatives for fields with odd residual characteristic, i.e., $2 \notin \mathfrak{p}$. In the latter half we assume odd residual characteristic, and give explicit formulas of typical spherical functions on X, where Hall-Littlewood symmetric polynomials of type C_n appear as a main term, parametrization of all the spherical functions. By spherical Fourier transform, we show the Schwartzspace $\mathcal{S}(K\backslash X)$ is a free Hecke algebra $\mathcal{H}(G,K)$-module of rank 2^n, where $2n$ is the size of matrices in X, and give the explicit Plancherel formula on $\mathcal{S}(K\backslash X)$. This is joint work with Yasushi Komori(Rikkyo Univeristy).

Takashi Taniguchi (Kobe University), Orbital L-functions for the space of binary cubic forms and their applications

We introduce the notion of orbital L-functions for the space of binary cubic forms and investigate their analytic properties. We describe the residue formula and shape of functional equations. We also explain their several applications.

Toshio Oshima (University of Tokyo), An elementary divisor theorem for the ring of ordinary differential operators

The local structure of linear ordinary differential equations with coefficients in holomorphic functions has been studied by Poincaré, Hukuhara, Turritten, Deligne etc. Here we give a constractive analysis on the structure from the view point of elementary divisors.

Kazuki Hiroe (Kyoto Univerisity), Linear ordinary differential equations on the Riemann sphere and representations of quivers

The Deligne-Simpson problem asks to determine the existence of irreducible monodromy representations of the Riemann sphere minus n-points which have required local monodromy. Its additive analogue also exists and asks for the existence of irreducible linear ordinary differential equations with regular singular points which have required conjugacy classes of their residue matrices. This additive analogue was solved by W. Crawley-Boevey. He found a correspondence between differential equations with regular singular points and representations of quivers with certain relations. Then he applied the existence of irreducible representations of quivers to that of irreducible differential equations. Also a generalization of this result to differential equations with one irregular singular point was obtained by P. Boalch. As a generalization of these results, we will consider differential equations with arbitrary numbers of unramified irregular singular points and associate it to representations of quivers. As an application of this correspondence, we will discuss the existence of irreducible differential equations with generic characteristic exponents.

Keiju Souno (University of Tokyo), Moments of the Epstein zeta functions

According to the classical theory of automorphic forms, the theta function associated to the quadratic form is decomposed into the sum of some Eisenstein series and some cusp form, and in special cases, the Fourier coefficients of the Eisenstein series is well known. In my talk, by using these theories, we give certain upper bounds for the moments of the Epstein zeta function associated to the quadratic form of n ($\geqq$ 4) variables.

Takeyoshi Kogiso (Josai University), Quadratic maps to PV's and local functional equations

Let P and P^* be homogeneous polynomials in n variables of degree d with real coefficients. It is an interesting problem both in Analysis and in Number theory to find a condition on P and P^* under which they satisfy a local functional equation, roughly speaking, of the form

$$\text{the Fourier transform of } |P(x)|^s = \text{Gamma factor} \times |P^*(y)|^{-n/d-s}.$$

According to the theory of prehomogeneous vector spaces, the basic relative invariant of an regular prehomogeneous vector space satisfies LFE. These are typical examples.

In 2007, F.Sato proved a pullback theorem of local functional equation and gave a new construction of polynomials with the property above. In this talk, we make self-dual non-degenerate quadratic mapping to the quadratic spaces by using representations of $C_p \otimes C_q$. Then we construct polynomials (of degree 4) which satisfy local functional equations by using the pull back theorem. Furthermore we will talk about the existence of dual quadratic mapping to another prehomogeneous spaces. This is joint work with Fumihiro Sato.